



# INSTRUCT-O-GRAM

## THE HANDS-ON TRAINING GUIDE FOR THE FIRE INSTRUCTOR

VOLUME XXI • ISSUE 1

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### ATTACK LINE HANDLING

#### TIME REQUIRED

Three hours

#### INSTRUCTIONAL AIDS

Two fully equipped pumpers  
Structure for use in advancing hose

#### MOTIVATION

The instructor should describe the importance of effective attack line placement and operations in fire suppression. The firefighter will demonstrate a general understanding of the construction, operation, and utilization of fog and solid stream nozzles and, by participation and observation, a knowledge of the various nozzles, hose layouts, appliances, and procedures involved in applying water at a structural fire.

#### OBJECTIVES

1. Describe the appropriate number, size, and placement of fire streams needed to deliver the required fire flow at structural fires.
2. Describe the engine company responsibility for supporting built-in fire protection systems.
3. Demonstrate various sizes of hose and different nozzles used to produce streams for fire attack.

4. Demonstrate the utilization of the engine company to support built-in fire protection systems.
5. Demonstrate the placement of fire streams at structural fires.

#### OVERVIEW

Handlines and master streams

Built-in fire protection system components

Hose and nozzle selection

Supporting built-in fire protection systems

Hose stream placement

#### I. HANDLINES AND MASTER STREAMS

##### A. Hose Line Selection

1. Engine company must consider the of limitations of various sizes of hose
2. In addition to flow limitation, there is factor known as friction loss which affects fire flows
  - a. Loss of pressure within hose line due to internal resistance of water against hose lining
  - b. Friction loss is affected by three factors
    - 1) Flow



- 2) Hose length
- 3) Size of hose
- c. Should consider engine company crew when selecting attack lines which must be stretched over long distances
3. Maximum flow capabilities for attack lines
 

1½ inch	125 gpm
1¾ inch	150 gpm
2 inch	200 gpm
2½ inch	250 gpm
3 inch	400 gpm
4. Range of nozzle flows for combination nozzles with recommended nozzle pressure of 100 psi
 

1½ inch	30 gpm to 125 gpm
1¾ inch/2 inch	95 gpm to 200 gpm
2½ inch	125 gpm to 250 gpm
5. Flows for a 2½ inch straight tip nozzle with recommended nozzle pressure of 50 psi
 

1 inch tip	210 gpm
1⅝ inch tip	266 gpm
1¼ inch tip	328 gpm
6. Flows from master stream devices
  - a. Fog nozzle minimum is 500 gpm at 100 psi nozzle pressure
  - b. Flows for straight tips with recommended nozzle pressure of 80 psi (rounded)
 

1½ inch	600 gpm
1⅝ inch	700 gpm
1¾ inch	800 gpm
1⅞ inch	900 gpm
2 inch	1000 gpm
7. Friction loss for attack lines
  - a. For 1½ inch, 1¾ inch, and 2 inch attack lines, 30 psi per hundred feet
  - b. For 2½ inch attack lines, 15 psi per hundred feet

- c. 1½ inch, 1¾ inch, and 2 inch attack lines should not exceed 300 feet in length
- d. 2½ inch attack lines should not exceed 500 feet
- e. When lengths of attack line beyond those recommended are required, consideration should be given to using 3 inch, 4 inch, or 5 inch hose to get water closer to the fire scene and dividing the flow into more manageable size attack lines using wyes or manifolds

#### B. Initial Attack

1. Indirect attack — fog stream used to attack fire from outside building
  - a. Should not be used to fight fire in occupied building
  - b. Quick interior attack should not be made in building undergoing demolition, abandoned, had previous fires or under construction
  - c. If large intense fire encountered, may be necessary to knock down or control fire from outside using solid stream before making interior attack
2. Solid streams versus fog streams
  - a. For safest and most effective operation where people are in area, solid stream or fog nozzle on solid stream position should be used
    - 1) Aid rescue
    - 2) Reduce steam production
  - b. Use of fog should be restricted to unoccupied confined spaces
  - c. When building is adequately ventilated opposite in direction from fog nozzle, fog stream can be used
    - 1) No more than 30-degree angle
    - 2) Produces reach and fog pattern



## 3. Effective stream operation

- a. Use solid stream nozzles or set fog nozzles on solid stream setting
- b. Stay low upon entering fire area to let heat and gases vent before moving in
- c. Before door to fire area is opened, all firefighters should be positioned on same side of entrance and remain low
- d. Crack nozzle and bleed air out of line ahead of water
- e. If fire shows at top of door as opened, ceiling should be hit with solid stream to cool and control fire gases
- f. Sweep floor with stream to cool burning debris and hot surfaces
- g. Do not open stream until fire can be hit, unless firefighter safety is involved
- h. Direct stream at base of fire if localized
- i. As advance is made, angle of stream should be lowered to hit main body of fire
- j. When main body of fire is knocked down, shut down stream and let area extra space vent
- k. When fire is knocked down, shut down
- l. Upon entering area which is very hot and finding no fire, withdraw immediately and check area below
- m. When attacking basement fire down interior stairs, solid stream should be used because fog will generate steam

## 4. Number of lines

- a. Attack main body of fire
- b. Get over fire
- c. On each side of fire
- d. Consideration given to mobility of hose and flow requirements

## C. Back-Up Lines

## 1. Purpose of back-up lines

- a. Used when initial attack lines cannot quickly control fire
- b. Not used to protect exposures or attack fire
- c. Held in readiness for use in place of attack lines
- d. May also be used for back-up or safety team

## 2. Stretched whenever not completely obvious that fire will be quickly extinguished with initial attack lines

- a. Taken into building immediately after initial attack lines
- b. Positioned close to initial attack lines
- c. Charged and ready for use

## 3. Size of back-up lines

- a. For 1½ inch lines, minimum 1¾ inch
- b. For 1¾ inch lines, minimum 2½ inch
- c. For 2½ inch lines, minimum 2½ inch with larger tip
- d. For fire where initial attack is 2½ inch line, master stream devices may be required

## 4. If back-up lines are placed in service, initial attack lines should be shut down

## 5. Once fire is controlled, back-up lines should be shut down and smaller line used for mop up

## 6. On any working fire, a back-up or safety team should be standing by with charged line and ready to make entry should the initial attack crew require assistance

## D. Master Stream Devices

## 1. Water supply for master streams

- a. Pumper at water source sending water to pumper at fire



- b. Adequate number of supply lines laid between pumpers and from pumper at fire to master stream device
  - c. No more than 100 feet of hose between pumper at fire and master stream device
- 2. Use of master stream devices
  - a. Fire attack
  - b. Back-up
  - c. Exposure protection
- 3. Solid stream versus fog stream
  - a. Solid stream most effective
    - 1) Wind conditions
    - 2) Strong draft created by large fire
    - 3) Distance from nozzle to building
  - b. Fog streams superior
    - 1) Exposure protection
    - 2) Covers wider area
- 4. Positioning device
  - a. Fog nozzle must be positioned close to structure
  - b. Solid stream functions better if positioned some distance from building
- 5. Directing heavy streams
  - a. Move horizontally back and forth across fire area
  - b. Move up and down to reach full depth
  - c. Look to see if water is entering building or hitting building

## II. BUILT-IN FIRE PROTECTION SYSTEMS COMPONENTS

### A. Standpipe Systems

- 1. Piping arrangement that carries water vertically and horizontally through building for firefighting operations
- 2. Two types of systems

- a. Dry system — not connected to water supply
    - 1) Interior system has at least one outlet on each floor
    - 2) Exterior system usually runs along fire escape
    - 3) May include multiple interconnected systems
  - b. Wet system — connected to one or more sources of water
    - 1) Minimum flow of 250 gpm at residual pressure of 65 psi on roof
    - 2) Minimum pressure of 40 psi on 1½ inch tip connected to 100 feet of 2½ inch hose attached to highest outlet with nozzle on roof
    - 3) May include multiple separate or interconnected risers
- 3. Fire department siamese
  - a. Water should be pumped into any standpipe system being used for firefighting
  - b. At least two lines should be connected
    - 1) First line to left intake and charged
    - 2) Second line to right intake
  - c. If supply line cannot be connected to siamese, water can be supplied to system through first floor outlet
  - d. Pumper should be positioned within 50 feet
- 4. Fire attack from standpipe systems
  - a. Equipment
    - 1) 150 feet of 1½ inch or 1¾ inch hose
    - 2) Nozzle
    - 3) Gated wye
    - 4) Pipe wrench in the event the hand wheel on outlet is missing



- 5) Secondary standpipe pack consisting of 2 inch or 2½ inch hose
  - 6) Short section (5 feet) of 2½ inch or 3 inch hose to go between outlet and gated wye
  - 7) Gated wye may be equipped with 1½ inch to 2½ inch increaser to permit connection of larger attack hose
- b. Beginning attack operations
- 1) Connect to outlet in stairwell on fire floor
  - 2) Pull excess hose up stairway toward next floor before charging
  - 3) If outlet in corridor, connect on floor below fire floor
  - 4) Be careful not to impede evacuation or allow great volumes of smoke in stairway

#### B. Automatic Sprinkler Systems

1. Types of systems
  - a. Wet system — piping completely filled with water from source to heads
  - b. Dry system — system contains water only from source to control valve
  - c. Pre-action system — dry system with air exhausters controlled by heat detectors
  - d. Deluge system — designed to deliver large volume of water; water only from source to control valve
2. Water supply
  - a. Can be supplied by gravity tank, pressure tank, fire pump, or water main
  - b. Engine company should attach two lines to siamese and prepare to pump system

### III. HOSE AND NOZZLE SELECTION

- A. During the evolutions below, the students will demonstrate their proficiency in the handling and use of various hoses and nozzles used to control and extinguish a fire.
- B. The nozzles will first be reviewed by the instructor. All water will be discharged outside the structure.
- C. The student should already be familiar with the appliances required and the techniques involved in the evolutions. What is being emphasized is teamwork and operating efficiency.

### IV. SUPPORTING BUILT-IN FIRE PROTECTION SYSTEMS

- A. Set up and establish a water supply from the attack pumper to a fire protection system using multiple lines of 2½ inch or 3 inch hose.
- B. The evolution will first be reviewed by the instructor before being run with moving apparatus.
- C. The evolution is designed to expose the student to the method of supporting built-in fire protection systems at the fire scene. The student should already be familiar with the appliances required and the techniques involved in the evolution. What is being emphasized is teamwork and operating efficiency.

### V. HOSE STREAM PLACEMENT

- A. The student will perform the following evolutions:
  1. Advance an uncharged 1½ inch, 1¾ inch, or 2 inch line up an interior stairs to a location above the ground floor
  2. Advance a charged 1½ inch, 1¾ inch, or 2 inch line up an interior stairs to a location above the ground floor
  3. Advance a charged 1½ inch, 1¾ inch, or 2 inch line down an interior stairs to a location below the entry floor



4. Advance an uncharged 1½ inch, 1¾ inch, or 2 inch line up a ladder to a floor above the ground floor
5. Advance a charged 1½ inch, 1¾ inch, or 2 inch line up a ladder to a floor above the ground floor
6. Advance a charged 1½ inch, 1¾ inch, or 2 inch line to the fire floor and a second charged line of the same size to the floor above the fire floor
7. Advance a charged 2½ inch line up an interior stairs to a location above the ground floor
8. Advance a charged 2½ inch line up a ladder to a floor above the ground floor
9. Advance a charged 1½ inch, 1¾ inch, or 2 inch line to the fire floor and a 2½ inch charged line to the floor above the fire floor
10. Advance an uncharged 1½ inch, 1¾ inch, or 2 inch line to the floor below the fire floor, connect it to the standpipe connection, charge it, and advance it to the fire floor. After charged, extend the line to a higher floor
11. Advance an uncharged 3 inch, 4 inch, or 5 inch line to the base of a structure, attach a wye, connect two 1½ inch, 1¾ inch, or 2 inch lines, charge the system, and advance the attack lines into the structure. This evolution will also require supporting the standpipe system.

12. Set up, advance lines, and charge a portable master stream device

- B. The evolutions will first be reviewed by the instructor before being run with moving apparatus. All water will be discharged so as to not damage any structures or surroundings.
- C. These evolutions are designed to expose the student to various methods of applying water at the fire scene. The student should already be familiar with the appliances required and the techniques involved in the evolutions. What is being emphasized is teamwork and operating efficiency.

## VI. REVIEW

- A. Handlines and master streams
- B. Built-in fire protection system components
- C. Hose and nozzle selection
- D. Supporting built-in fire protection systems
- E. Hose stream placement

## REFERENCES

*Engine Company Fireground Operations*, 2<sup>nd</sup> Edition, NFPA, Pages 2-6, and Chapters 4 and 6-11

*Essentials Of Fire Fighting*, 4th Edition, IFSTA, Chapters 12 and 13

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